#### NAL PROPOSAL No. 0090

Correspondent: J. Gierula

Institute of Nuclear Research Laboratory of High Energy Physi Al. Mickiewicza 30

Cracow, Poland

#### CRACOW NUCLEAR EMULSION EXPOSURES

J. Gierula

Institute of Nuclear Research Cracow, Poland

June 19, 1970

## NATIONAL ACCELERATOR LABORATORY 🗇

P.O. BOX 500
BATAVIA, ILLINOIS 60510
TELEPHONE 312 231-6600
DIRECTORS OFFICE

August 27, 1970

Professor J. Gierula Institute of Nuclear Research Laboratory of High Energy Physics Krakow, Poland

Dear Dr. Gierula:

Thanks very much for your letter of August 12 describing in further detail the emulsion exposure which you wish to perform during the early period of operation of the NAL accelerator. There is nothing about your request which seems particularly complicated to me. I see no reason why we cannot carry it out more or less as you have suggested. My own experience with Ilford G-5 pellicles does not go beyond the 1 in. x 3 in. dimensions, but we should certainly be able to arrange for the processing of the larger pellicles that you prefer.

The monitoring of the exposure will be somewhat tricky and may require several trial exposures before the final bombardment is made. In view of these problems, and knowing the degree of artistry that is involved in the development and remounting of emulsion pellicles, I wonder whether it is not your plan to be present at our Laboratory at the time when the exposures are run. I think it would be very desirable for you to be able to be here to explore the control and choice of exposure fluxes and to supervise the development of the emulsions. Can such a visit be arranged from your end? If so, we shall undertake to inform you, at least several weeks in advance, of the time when your exposure might be made. I imagine this may occur sometime in the autumn or winter of 1971. I look forward to hearing from you about your plans in this regard. I did raise the question of your exposures with our Program Advisory Committee a few weeks ago, and they have approved the Laboratory's scheduling of your work at its own initiative.

Sincerely,

Edwin L. Goldwasser

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ODDZIAŁ W KRAKOWIE 90-2

INSTITUTE of NUCLEAR RESEARCH - LABORATORY of HIGH ENERGY PHYSICS CRACOW DEPARTMENT

J. Gierula

August 12, 1970

Adres: KATEDRA FIZYKI II AGH Address: Al. Mickiewicza 30 KRAKÓW (Poland)

Dr Edwin L. Goldwasser

National Accelerator Laboratory P.O.Box 500 Batavia, Illinois 60510 U. S. A.

Dear Doctor Goldwasser:

Thank you very much for your letter of July 16 and for the May report of the Experimental Facilities Section. I am very much obliged to you for your intention to discuss my letter with your Program Advisory Committee.

According to your suggestion I am going to describe the requirements of the eventual exposure of emulsions more in detail.

of course it would be of special interest to have the exposure by protons of highest possible energy, say 500 GeV. The stack of Ilford G-5 emulsion /or any equivalent/ should contain 15 sheets of stripped emulsion 600  $\mu$  thick with dimensions 7.5 cm x 15 cm. The 15 cm side should be parallel to the direction of the proton beam. The per plate length of a track should be 6 cm or more. This means that the plates should be parallel to the beam direction within  $\pm 10$  mrad or better. The optimum density of proton tracks is about  $1 \div 3 \times 10^5/\text{cm}^2$  at the entrance side of the stack. The total number of protons entering the stack should be not smaller than about  $10^5$ .

Do you think that it would be possible to fulfil these requirements in the early portion of the external proton beam or elsewhere?

We intend to collect an unbiased sample of about 1000 interactions by the systematic following of primary tracks, and to measure the angular distributions of secondary tracks in all events.

Another question which seems to be of general interest is a purely experimental comparison of interactions produced by protons and pions at the same /possibly high/ energy. For such a reason it would be necessary to have two such stacks, one for proton and snother for pion irradistion, I wonder whether such irradiations could be done at MAL in the near future.

I expect to get the preprints of our work on cosmic ray jets in few days, Then I shall send you a copy immediately.

Yours yery sincerely,

### NATIONAL ACCELERATOR LABORATORY

P.O. BOX 500
BATAVIA, ILLINOIS 60510
TELEPHONE 312 231-6600
DIRECTORS OFFICE

July 16, 1970

Professor J. Gierula
Head of Emulsion Laboratory
Al. Mickiewicza 30
Krakow,
POLAND

Dear Professor Gierula:

Professor Wilson has passed to me your letter of June 19 inquiring about the possibility of irradiating a stack of nuclear emulsions near a beam of our accelerator in the near future.

I agree with you that exploratory studies in emulsions may be very interesting and useful during the early period of operation at the new energy region that will be available at NAL. Since such exposures are not very demanding of accelerator time or facilities, I can see no reason why an irradiation should not be scheduled for you.

You are probably aware that our present plan is to accelerate protons to high energy soon after July 1971. We do not expect that our experimental areas will be in useful operation for about a year after that. Nevertheless, it may be possible to make the kind of irradiation in which you are interested in some part of the accelerator enclosure itself or in the early portion of the external proton beam transport.

Together with the early operation of our machine, we have recently announced that we expect to be able to accelerate protons to as high as 500 GeV right from the start of operation. This may be of interest to you in planning your detailed request for an exposure.

I am sure that you have available to you, at CERN if nowhere else, copies of our Design Report and other literature relevant to the operation of our machine and the layout of our facilities. I am enclosing herewith a recent report of the Experimental Facilities Section describing the current status of our plans for experimental areas and beams. I suggest that you look over this material and then write to me again describing, somewhat more in detail, the actual requirements of the exposure in which you are interested. In the meantime, I shall plan to discuss your letter of intent with the members of our Program Advisory Committee at their meeting this August.

-2-July 16, 1970 Professor J. Gierula

With regard to the processing of emulsions that might be exposed in our beams, we do not currently have any firm plans to have extensive facilities for the development of nuclear emulsions. I shall now explore the possibility of making use of existing facilities at Argonne or at other nearby laboratories. We shall also give thought to the need for such facilities at NAL, but it is my inclination, instead, to arrange to use existing facilities elsewhere.

I shall welcome receipt of the report of your work on cosmic ray jets that is to be published shortly.

Sincerely,

Edwin L. Goldwesse

Edwin L. Goldwasser

Enclosure

cc: Prof. Gierula at CERN

bcc: J. Sanford w'copy letter from Gierula F. T. Cole w'copy letter from Gierula

# ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

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Votre référence

Your reference

Professor R.R. Wilson

National Accelerator Laboratory

BATAVIA, Ill.

USA

Notre référence Our reference

> A rappeler dans la réponse Please quote in your reply

Genève. 19 June 1970

Dear Professor Wilson,

c.: Prof. V.F. Weisskopf.

At the Scientific Council of CERN I mentioned to Professor Weisskopf that I would be very much interested in getting a small stack of nuclear emulsion plates irradiated in the Batavia machine in the near future. Professor Weisskopf suggested to me to write a letter to you directly.

I have a group of physicists and scanners in my laboratory in Cracow, Poland, which has very good experience in measurements and analysis of cosmic ray jets. In the last year we did the first analysis of  $60 \text{ GeV/c} \, \pi^{-}$  interactions in emulsion from the Serpukhov machine. The results were presented at the Lund Conference and are published in Physics Letters. We are preparing for publication an analysis of an unbiased sample of cosmic ray jets at the energy  $\sim$  1000 GeV. I shall send you the first draft after my return from CERN to Cracow.

It seems to me that it would be of general interest to do an analysis of jets in emulsion in a very first period of work of Batavia accelerator. We consider, having another experiment with Serpukhov, that we shall be able to do such an analysis in few months after getting the material.

I should be very greatful to you to have your opinion concerning the possibility of making such an irradiation. I am, of course, prepared to send you any additional information you need (e.g. letter of intention, depending on the specification of available internal or external beams, intensity limits, eventual help in processing plates).

Looking forward to hearing from you I am.

Yours very sincerely.

Prúf. J. Giorula,

Head of the Englishon Laboratory

Al. Mickiewicza 30

KRAKOW

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